ENTOMOLOGICAL NEWS

APRIL, 1939

Vol. L **No. 4**

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PHILADELPHIA, PA.

THE ACADEMY OF NATURAL SCIENCES,

1900 Race Street

Entered at the Philadelphia, Pa., Post Office as Second Class Matter.
Acceptance for mailing at the special rate of postage prescribed for in Section 1.
Act of October 3, 1917, authorized January 15, 1921.

ENTOMOLOGICAL NEWS

published monthly, excepting August and September, by The American Entomological Society.

Philip P. Calvert, Ph.D., Editor; E. T. Cresson, Jr., R. G. Schmieder, Ph.D., V. S. L. Pate, Associate Editors.

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The subscription price per year of ten (10) numbers is as follows: United States and possessions, Central and South America $3.00, Canada $3.15, Foreign $3.25, Single copies 35 cents.

ADVERTISING RATES: Full width of page. Payments in advance.

One issue, 1 in., $ 1.20, 3 in., $ 3.00, 5 in., $ 5.00, 7 in., $ 7.00
Ten issues, " 8.00, " 25.00, " 45.00, " 60.00

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ENTOMOLOGICAL NEWS, 1900 Race Street, PHILADELPHIA, PA.

MANUSCRIPTS AND ADVERTISEMENTS should be sent to the editor, Dr. P. P. Calvert, Zoological Laboratory, University of Pennsylvania, Philadelphia, Pa.

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ENTOMOLOGICAL NEWS

VOL. L. APRIL, 1939 No. 4

On the Dimorphism of Cocoons of Sphecophaga burra (Cresson). (Hymenoptera: Ichneumonidae).

By RUDOLF G. SCHMIEDER, Zoological Laboratory, University of Pennsylvania.

The ichneumonid parasites that inhabit the nests of hornets and yellow-jackets have attracted considerable attention. In 1828, Curtis described the habits of the European species, *Sphecophaga vesparum* (Curtis), and discussed the problem of the succession of its generations through the year. Since that time this problem has been dealt with by a number of authors, English, German, and French, without, however, receiving a satisfactory solution.

The common American species, *S. burra* (Cresson), has not had so many observers, although it presents the same problems that the European species does. In addition, my own observations show that it exhibits a very striking and very puzzling phenomenon, not recorded for the European species,—the production of two kinds of individuals, morphologically alike but differing from each other in the length of their life history and in the type of cocoon that they spin. It is the purpose of the present paper to call attention to the interesting problem presented by the existence of these two kinds of individuals and to record the data which I have gathered in order that others who may come upon parasitized hornets' nests will, it is hoped, be able to make additional observations and perhaps find a solution for questions here left unanswered.

SECURING NESTS.

In securing nests of hornets and wasps, I observed certain precautions in order to avoid being stung too badly. I used a bee-veil to protect my face, and tied shut my sleeves and trouser legs. After approaching the nest as quietly as possible, I quickly plugged the nest entrance with a wad of absorbent cot-

ton and poured a generous quantity of chloroform over the nest. The chloroform acted upon those hornets that were still in the nest so that the numbers of the defending host did not become too great. Then I enclosed the nest as quickly as possible in a large sheet of mosquito netting and detached it from its support. At the laboratory, I placed the nests in a large can and etherized the inhabitants, then tore the nest apart, and transferred its contents to a wire insect-breeding cage. (If left too long in the mosquito netting, the hornets chew their way out through the cloth.) The exposures to chloroform and ether do not kill the hornets, their brood, or their parasites. Some nests I secured at night, when, employing the same procedure, I sometimes entirely avoided being stung.

OBSERVATIONS.

Sphecophaga was first encountered in two nests of the white-faced hornet, *Vespa maculata* Linn., taken at West Manayunk, Pennsylvania, September 10, 1922. These nests contained probably fifty to sixty parasites, but no actual record of the number of individuals was made. I did prepare a crude pen sketch to show what I found to be the typical condition of a parasitized hornet's cell with its two very distinct types of parasite cocoons, and I wrote out brief notes on the relative positions of these cocoons within the cell, as well as a description of the cocoons themselves. The series of specimens that I sent to the Bureau of Entomology and that Mr. R. A. Cushman kindly determined were from these nests; they are referred to in a paper by Mr. Cushman (1933). Of other nests secured during the succeeding winter and spring, those that contained parasites were: One from the same locality as above, taken December 27, 1922, and one from Cobb's Creek, Pennsylvania, May 4, 1923. In the years following, additional hornets' and yellow-jackets' nests were secured but not until 1935 was *Sphecophaga* again found. In that year, two *Vespa maculata* nests, taken at Media, Pennsylvania, contained together the small number of five parasitized cells, which yielded only eleven cocoons.

In the Cobb's Creek nest were found several *Sphecophaga*

cocoons from which secondary parasites emerged which were kindly determined by Mr. A. B. Gahan as the chalcid *Dimmockia incongrua* (Ashm.). I reared many successive generations of this chalcid upon larvae of mud-dauber wasps but found no features of unusual interest in its life history.

In the yellow-jacket nests taken, I have not found parasites of any kind, although *S. burra* has been recorded (Zabriskie, 1894) from *"Vespa germanica,"* no doubt *V. maculifrons* Buy, and the European species is also common in the nests of a number of different species of *Vespa,* including the hornet *V. crabro* as well as the smaller yellow-jackets (Reichert 1911, Schmiedeknecht 1914).

Upon examining the combs of the large and prosperous nests taken in September, I found the paper-cells of the larger combs occupied in part by larvae and in part by the cocoon-enclosed pupae of drones and queens. In the cells containing the hornet larvae no parasites were observed; nor did any appear in the course of the next five or six days. During this time, the larvae continued to live, but they gradually diminished in size as the result of the now completely one-sided trophallaxis from which the adults that were confined with them alone benefitted. This observation does not, however, exclude the possibility that some of these larvae may have contained young endoparasitic stages of *Sphecophaga.* Morley (1900) states that in *S. vesparum* the female oviposits in the body of the hornet larva, that the young parasite larvae feed upon the fat-body of the host without interfering with its development, and that, not until later, after the host has spun its cocoon and has pupated, do the parasites begin to feed externally upon that host pupa.

Only within the cells containing the pupae of hornets were the larvae and pupae of the parasite *S. burra* encountered. The cells containing parasites were scattered among the unparasitized cells and there seemed to be no way of distinguishing them externally. It was necessary to cut off the tops of the hornet cocoons and to expose the pupae. If the then exposed head of a pupa lacked the normal opaque white color and was translucent and watery in appearance, one could be sure that

pulling this pupa out of the cell would reveal the presence of a number of *Sphecophaga* larvae or cocoons in the bottom of the hornet cell. If only one parasite were present, the hornet pupa was still almost normal in size and appearance. If, however, six or seven parasites had fed on the hornet pupa, then only the head and anterior part of the thorax had retained their normal shape, while the rest of the host pupa was very much shrunken and tapered, although still appearing fresh and clean.

The number of parasites present in a cell varied from one to seven; the average number was three. For the most part the parasites were already enclosed in their cocoons, and these cocoons, it was immediately evident, were of two totally different kinds. The one sort was tough, parchment-like, light brown or yellowish brown in color and firmly attached to the sides and bases of the host cells. The other was quite delicate, white in color, and loosely attached to the sides of the cells. These two kinds of cocoons are so different that Zabriskie (1894), who found them in *Vespa* nests from New Baltimore, New York, and described them very accurately, believed that they represented two different species of parasites. That author also correctly observed that the tough brown cocoons are always in the very base of the cells and that, when such cells are cleaned out by the wasps, the cocoons of the parasite are not removed but are allowed to remain as the base of the cell.

In the large queen cells of *Vespa maculata* nests, three or four vertically placed brown cocoons often filled the bases of the cells just distal to the excrement discharged by the host larvae. If only a single brown cocoon is present, it also is placed vertically but occupies only one angle of the cell. All these brown cocoons contained larvae; some were still spinning, others were already in diapause. From such cocoons no imagines emerged until the folllowing April. There is no doubt but that these brown cocoons represent the typical form of *Sphecophaga* cocoon, not only because they are twice as numerous as the other form but also because they are entirely like those that have been described and figured (Reichert 1911) for the European *S. vesparum.*

The second form of cocoon does not in any way resemble the typical form but is a delicate structure of white silk with a fluffy texture quite different from that of the brown cocoons. Furthermore, these white cocoons are loosely attached anywhere upon the inner walls of the hornet cell. The larvae in the white cocoons undergo transformation immediately they have finished spinning and emerge as adults about one week later. They never enter into the long diapause characteristic of the larvae in the brown cocoons.

In the first nest from which counts were made of cocoons, the nest from West Manayunk, twenty-three parasitized hornet cells were found and these yielded altogether fifty-one brown and eighteen white cocoons, as shown in the accompanying table. This table also gives the records from the other nests.

Locality of nest	No. of cells in nest	No. of brown cocoons	No. of white cocoons
W. Manayunk	23	51	18
Cobb's Creek	26	41	25
Media (a)	2	5	2
Media (b)	3	2	2
Total	54	99	47

Among the cells examined there were thirty-three that contained only brown cocoons, from one to four per cell. In sixteen cells out of the total of fifty-four, both brown and white cocoons were present in the same cell. In such cells it was usual to find two or three brown cocoons firmly attached to the sides and base of the cell, while two or three white cocoons occupied the space between the brown cocoons and the remains of the host pupa. Rarely only white cocoons, numbering from one to five, are present in a cell to the exclusion of brown ones. This condition was seen in three cells of the Cobb's Creek nest, and in two from a Media nest, but was never encountered in the West Manayunk nest.

Since the white cocoons are nearly always found only in the same cells with brown cocoons, and since in all the nests examined only a small percentage of the host pupae were parasitized, it is necessary to conclude that the same mother may

produce both kinds of offspring. Even in the nest designated in the table as "Media (a)," in which only two cells of a large and prosperous hornets' nest were parasitized, these cells contained both brown and white cocoons. It is unlikely that two different females would oviposit in the same two cells out of hundreds of possible cells.

From the position of the *Sphecophaga* larvae in the host cell and from the appearance and the position of the remains of the host, it is evident that the parasites feed only at the posterior end of the host and, furthermore, that those larvae that spin the brown cocoons must have completed their feeding and begun spinning earlier than those that produce the white cocoons.

The imagines obtained from the two kinds of cocoons were identical in appearance except that, to quote from a letter from Mr. Cushman to whom I had sent a series for determination: "The fall-emerging specimens [from white cocoons] appear to be consistently stouter than those emerging in the spring [from brown cocoons]. . . ." All adults which I obtained were females and the species is, like the European one, evidently thelytokous. Males are extremely rare.

From the data that have been presented it is clear that there are two kinds of individuals of *S. burra:* Those that spin brown cocoons and undergo a long larval diapause, and those that spin white cocoons and transform without a diapause. It is also evident that these two forms are not representatives of different generations but that they are really individuals of the same generation and occur as offspring of the same mother.

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Two New Species of Agromyza from South America (Dipt.: Agromyzidae).

By S. W. FROST, The Pennsylvania State College.

Agromyza braziliensis n. sp.

A large species, 4.5 to 5 mm.

♂: Front, face, cheeks, palpi, antennae, scutellum, halteres and legs largely pale yellow. Margin and fringe of calypteres dark brown.

Front and orbits concolorous pale yellow, front together with orbits about as wide as either eye, sides parallel; four pairs of strong fronto-orbital bristles, lower three pairs approximated in their rows, the upper bristles more widely separated, the lower two pairs pointing inward, the other two pairs pointing upward, a few minute hairs on the upper outer angles of the orbits next to the eye margin; frontal lunule not conspicuous; bases of antennae approximated; cheeks yellow more than one-half the eye-height, narrower in front than behind; a strong pair of oral vibrissae accompanied by about six bristles along the lower edge of the cheek; proboscis and palpi yellow, setae on the palpi black, those on the proboscis yellow; antennae entirely yellow, third segment small and rounded, second segment with a short dorsal bristle, arista black, almost bare, distinctly swollen on the basal fifth and about four times the length of the third antennal segment; occiput pale yellow on the sides, brown above towards the middle, ocellar triangle small, shiny brown continuous with the color of the occiput, ocellar bristles long extending to the frontal lunule.

Mesonotum sub-shiny black with a large yellow spot on the posterior margin, the anterior margin of this spot prolonged

into a point reaching nearly to the middle of the mesonotum, the black color narrowed on the fore part of the mesonotum so that the presutural bristles are located on the edge of this colored area; scutellum broadly yellow in the middle and below, darkened along the sides; pleura largely yellow, the yellow extending above the base of the wings and including the anterior humeral callosities, the sternopleura bears a large triangular black spot leaving a narrow yellow band across the upper portion, the mesopleura bears a narrow, darkened, transverse band below, the pteropleura has a small, darkened, triangular spot; there is also a small, darkened spot in front of the base of the wing, and a small spot above the suture of the mesopleura; there are four well-developed pairs of dorsocentral bristles, four irregular rows of acrostichals reaching from the anterior to the posterior margin of the mesonotum; two pairs of presutural bristles, outer pair large, inner pair smaller; one strong sternopleural bristle accompanied by numerous smaller setae, 1 strong mesopleural bristle with numerous smaller setae along the upper margin of the mesopleura, humeral bristle strong accompanied by numerous smaller bristles.

Legs largely yellow, coxae and femora entirely yellow, tibia and tarsi slightly darkened, a distinct posterior bristle near the middle of the mid tibia.

Abdomen brown above, yellow on sides and below, incisures minutely and indistinctly yellow, genetalia subshiny brown.

Wings hyaline, slightly smoky, veins brown, base of costa and first vein to and slightly beyond the humeral cross-vein, yellow, fifth vein slightly stronger, auxillary vein faint but separate from first vein and ending separately in the costa, costa extending to the fourth vein, two strong setae on base of the costa, anterior cross-vein at about the end of the first vein and near the middle of the discal cell, veins two and three diverging slightly at their tips, veins three and four nearly parallel at their tips, vein four terminating near the tip of the wing, distal section of the fifth vein about one-and-a-quarter times the length of the penultimate section; halteres pale yellow

including the stalk; calypteres gray, margin and fringe dark brown.

♀ similar to the ♂ but darker in color, yellow incisures on edges of abdominal segments more conspicuous, genitalia shiny black.

Holotype ♂ reared August 1937, Sao Paulo, BRAZIL, by Luiz O. T. Mendes. Seven paratypes; six males and one female bearing same date and locality. Holotype will be deposited in the U. S. National Museum.

This species runs close to *quadrata* in Malloch's key to the Diptera of Patagonia and Chile, 1934. It differs in coloration and in the number and position of the acrostichals. In *braziliensis* there are only four rows of acrostichals and they extend the whole length of the mesonotum.

Agromyza ecuadorensis n. sp.

A large species, 4.5 to 5 mm.

♂: Front, face, cheeks, palpi, scutellum and legs largely yellow, margin and fringe of calypteres dark brown.

Front pale yellow; orbits darkened on upper half, front together with orbits as wide as either eye, sides parallel, four strong pairs of orbital bristles, about equally spaced in their rows, the lower two pairs turned inward, the other pairs turned upward, orbital hairs sparse, minute, almost invisible; frontal lunule not conspicuous; cheeks yellow, at narrowest portion less than one-half the eye-height, cheeks narrower in front than behind; a strong pair of oral vibrissae accompanied by a row of strong setae along the lower edge of the cheeks; proboscis and palpi, yellow; setae of palpi black, those on proboscis yellow; antennae entirely yellow, third segment short rounded at the tip; arista black, nearly bare, swollen on the basal one-fifth, about four times the length of the third antennal segment; occiput shiny black continuous with the ocellar triangle and upper orbits.

Mesonotum subshiny black, a large yellow spot on the posterior margin, the anterior margin of this spot prolonged into a point reaching nearly to the middle of the mesonotum; the black area of the mesonotum broader than in *braziliensis* with

the result that the presutural bristles are situated well within the dark color; scutellum broadly yellow in the middle and below, darkened on the sides; pleurae largely black, the pteropleura, mesopleura, and sternopleura with large black spots, only the upper edges of these narrowly yellow; four well-developed pairs of dorsocentral bristles, about four rows of acrostichals, these do not extend to the posterior margin of the mesonotum, they terminate before the yellow spot with the exception of one minute pair just before the scutellum, the acrostichals are not as strong as in *braziliensis* and are more sparse; one strong sternopleural bristle accompanied by numerous smaller setae, mesopleura with one strong bristle and numerous smaller setae along the upper edge; humeral bristle strong accompanied by numerous smaller setae.

Legs largely yellow, front femora and tibiae yellow, middle and hind tibiae darkened, all tarsi darkened, coxae yellow with darkened spots at the bases, mid tibia with a distinct posterior bristle near the middle.

Abdomen entirely brown, incisures very indistinctly yellow, last incisure only conspicuously yellow; genetalia dark brown, yellow only in the middle.

Wings hyaline, slightly smoky, base of costa and first vein to the humeral cross vein distinctly yellow, wings rounded at tips, auxillary vein faint but ending separate from vein one in the wing margin, costa extending to the fourth vein, two strong setae on the base of costa, anterior cross vein slightly before the end of vein one and situated in the middle of the discal cell, anterior cross-vein about one-fourth the length of the posterior cross-vein, veins two and three diverging slightly at their tips, veins three and four nearly parallel at their tips, distal section of fifth vein about one and a quarter times the length of the penultimate section; halteres pale yellow including the stalk; calypteres gray, margin and fringe dark brown.

Holotype ♂, Baños, ECUADOR. February 19, 1937. Collected by S. W. Frost. Differs from *braziliensis* in coloration, smaller and more sparse acrostichals and only one pair of presutural bristles. The holotype will be deposited in the U. S. National Museum.

Iridescence.

By Wm. T. M. Forbes, Cornell University,
Ithaca, New York.

(Continued from page 44.)

*Chloripp*e *cyane reducta* (Peru). 1, purple spot on fore wing oriented, light 30 U 0; viewed at almost any angle, with azimuths under L or 75 R, perhaps best at 45 U 0, and converse.

2, Deep purple edges of hind wing oriented 30 U 90 L; 45 U 0. It also appears at various other angles, such as 30 U 0; 60 U 90 L; but at the majority of orientations is invisible,—e. g. at 45 U 180; 45 U 0 there is no purple on either fore or hind wing, though the blue of hind wing is plain.

3, specular at medium angles, a large blue patch on hind wing,—blue at 45, green at 90, fainter but very green at 30 U 180; 45 U 180; strongest purple at 30 U 0; 30 U 180 and converse, but weak at right angles to this.

4, under side of hind wing shows rather critical purple shades near base of costa in cell and above middle of outer margin at 90 U; 90 U, the angle of light more critical than the angle of sight.

C. cyane (typical, from Columbia). 1, is more critical, best at 30 U; 45 U 0. 2, is intense blue rather than purple at most angles, e. g. 15 U 0; 45 U 45 L, but is purple at 15 U 0; 60 U 90 L. 3, is the same. 4, not distinct.

C. c. burmeisteri (Argentine). 1, same but weaker. 2, at same angles as *cyane*, but matching the specular patch in color, —at 15 U 0; 45 U 45 L only the border is bright, at specular angles only the large patch. 3, specular and blue at almost all angles; not becoming green at high angles or even at 30 U 180; 45 U 180, but purple at grazing angles (15°) regardless of direction. 4, like *reducta*.

C. cherubina (South America). 1, blue, not purple, at same angles. 2, intense green at 15 U 0; 30 U 45 L, where patch is a faint brassy green; changing rapidly to purple at 30 U 0; 45 U 60, at which angle the patch is a brilliant brassy green.

3, yellow green at 90, blue green at 45, blue at 30; purple at grazing, green at other than specular angles. 4, not distinct.[1]

[1] The most distinctive angles for the determination of blue Chloripp*e*s are: 1, 30 U 0; 45 U 0 for the purple of *cyane* and blue of *cherubina* on fore wing (i. e. back to light, head of butterfly to observer, tilted at a low angle). 2, 90; 90 to discriminate specular colors best (blue of *burmeisteri*, blue-green of *reducta*, green of *cyane* and *cherubina*), also extent of specular blue or green on fore wing.

C. pavon (South America). Oriented 45 U 0; 60 U 0. a slightly freakish case, visible from most angles if light and sight are about the same and front or left, but not rear or right.

C. laure (South America) Oriented. 45 U 45 L; 45 U 45 L. A brilliant purple patch, overlapping the orange slightly on fore wing and giving it a salmon tint. This is more critical than the last, but still conspicuous from horizontal angles of 0 to 90 L. At 90; 90 however there is no iridescence.

Apatura iris (Europe). Of the same type as the last but still more critical,—probably best at 45 U 45 L, 45 U 45 L. At 0 horizontal angle the purple is almost lost from the fore wing, but at 30 U 180; 45 U 90 L it is almost confined to the fore wing.

Thanaos lucilius (Eastern U. S.). *T. lucilius* and *baptisiae* are an example of extremely difficult and critical iridescence. It is very faint, best visible under low power of the microscope and with a dark background, but as illumination and vision should be at nearly right angles it is convenient to use a microscope. The color changes under such a narrow range of angles that the color may perhaps be due to striation rather than the usual thin plates.

1, Oriented 15 U 90 R; 75 U 90 L. Green, shading from somewhat bluish to somewhat brassy and strongest close to margin.

2, 30 U 90 R; 60 U 90 L, in a very narrow range a little less rather than more than 30°. Light portions varying from coppery through rose to crimson, dark portions very faintly crimson to violet.

3, 45 U 90 R; 45 U 90 L. Brassy on light portions, very faintly purple on postmedial dark band.

At still deeper angles the iridescence goes through green to copper again at grazing view and perpendicular light.

4, 5 U 90 L; 90 U (grazing from opposite side) copper, the dark parts not distinguishable.

5, 15 U 90 L; 90 U. The best (and a rather decided) green, the dark postmedial stripe well contrasted.

6, 30 U 90 L; 60 U 90 R. Light parts brassy, dark parts with very faint purple and hints of rose.

7, 45 U 90 L; 45 U 90 R. Green again.

At higher angles of illumination and going to grazing angle of sight it goes again through copper before fading out.

T. baptisiae (Woods Hole, Mass., holotype). Essentially the same rapidly changing series of colors but much toned

down. 1, faint green at margin, stronger and flecked with copper in fringe; 2, light portions faintly brassy toward margin, shaded with traces of rose along veins; 3, as before but much toned down and dominated by the brown ground color; 4, 5, 6, 7 the iridescenses of T. lucilius can be just divined in the best lighting but are wholly dominated by the pigment browns and buff. The greener or brassy appearance mentioned in the original description of baptisiae is due to the greater dominance of the brown to yellowish pigment colors, which kill the purple but reinforce the brassy tints of the iridescence.

Talanga. (Indo-australian). This is the genus that started the present study.

The iridescence is brilliant, only slightly oriented, but varies enormously with angle. For the discrimination of species[2] the best position seems to be with light and sight both at medium angles from opposite sides.

T. sabacusalis (New Guinea). 30 U 90 L; 60 U 90 R. Oriented and changeable. Ground of fore wing bright rose, except base and borders; postmedial area and outer subterminal stripe the same. Double spot at end of cell, spot below and beyond it and inner st. stripe brilliant blue, specular. Hindwing with a triangular area covering forks of Cu and M_2 and $_3$ the same, shading into brassy and green on basal half, except anal area, the postmedial costal area less brilliantly rose; a short postmedial bar brilliant blue, shading into greenish, specular, but only visible when angles of light and sight correspond closely, also with a slight rose edging; marginal patch mixed copper, brass, purple and green, going to dark bronze at 15 U 90; 90 U.

At 45 U 90 R; 45 U 90 L the same colors show, but not at reciprocal angles (save the blue).

T. tolumnialis (New Guinea) 30 U 90 L; 60 U 90 R. Similar; base with two narrow stripes of silvery iridescence; blue at end of cell as before; pm. area silvery rather than rose, but both st. stripes dull rose, alike, the inner halves of both going to bright blue and outer halves going dull at grazing angle (5 U; 90 U). Hind wing as before, but less brilliant, except for the costo-apical region which is rose and distinctly runs into the metallic marginal patch. I cannot see Janse's key character between the hind wings of these species. Both

[2] See Janse, Pyralidae in Mem. Mus. R. d'Hist. Nat. de Belgique; Resultats Scient. du Voyage Ind. Or.Néer. Leopold, iv fasc. 12, 11-16, pls. 3-5, 1935. He writes me that his descriptions were made with light at right angles from the side.

show the same iridescence in color and position, only the present is less brilliant.

T. sexpunctata (Formosa, Timor). Iridescence on the same plan and visible at the same angles; but with the basal and postmedial areas of fore wing intermediate, blue shading into rose, and hind wing with the rose beyond the p. m. bar stronger, extending to the marginal patch, which latter is almost evenly green.

So far then as these three species are concerned we might modify Janse's key as follows:

4*a*. Basal half of fore wing (viewed at 30 U 90 L; 60 U 90 R or 45 U 90 R; 45 U 90 L) evenly rose to violet except the narrow base and borders; green and brassy iridescence on basal half brighter than rose on outer part of costal area ..... *subacusalis*

b. Iridescence of basal half of fore wing interrupted by a broad yellow stripe; largely blue or silvery; rose on outer part of costal area stronger than that on base of hind wing 5

6*a*. Iridescence of basal half of fore wing bright, largely blue; iridescent marginal patch of hind wing green; the black immediately before it in the form of a heavy double crescent corresponding to the two marginal dots, *sexpunctalis*

b. Iridescence of basal half of fore wing pale and silvery; marginal patch of two portions, a small copper one close to margin, and a broader and faintly silvery one before it, bounded on the inner side with a more distant, even and finer brown-black line..... *tolumnialis*

The cordatus-group of Agabus (Coleop.: Dytiscidae).

By MELVILLE H. HATCH, University of Washington, Seattle, Washington.

Agabus bjorkmanae nom. nov.

Anisomera recta LeC., Ann. Mag. Nat. Hist. (4) IV, 1869, p. 375.—Crotch, Trans. Amer. Ent. Soc. IV, 1873, p. 424.

Agabus rectus LeC.*—Sharp, On Aquat. Carn. Col. 1880-82, p. 756.

Agabus (Gaurodytes) rectus LeC.—Seidlitz, Verh. Nat. Ver.

* Preoccupied in *Agabus* by *Colymbetes (Agabus) rectus* Babington, Ann. Mag. Nat. Hist. VI, 1841, p. 53, now considered a synonym of *striolatus* Gyll.

Brünn XXV, 1887, p. 84.—Zimmermann, Col. Cat. 71, 1920, p. 171.

Agabus (Hydronebrius) rectus LeC.—Fall, Rev. N. A. Species Agabus, 1922, pp. 1, 3, 9.—Zimmermann, Kol. Rundsch. XX, 1934, p. 152.

This species is sufficiently distinguished from *cordatus* LeC. by Fall, but the pronotum is very variable. One extreme is represented by specimens in which the width of the base is just visibly greater (about one per cent) or barely less (three or four per cent) than the middle, the sides behind the middle nearly straight, not or very slightly sinuate, the hind angles rectangular or nearly so. At the other extreme are specimens in which the width of the base is distinctly less (six to nine per cent) than that of the middle, the sides behind obliquely convergent, the hind angles somewhat obtuse. Were it not for the existence of intermediates, one would scarcely hesitate to recognize two species. The color is usually black, but in one specimen, perhaps from immaturity, the vertex of the head is faintly bimaculate, the sides of the pronotum, the side pieces of the prothorax, the elytral epipleurae, and the apices of the last four abdominal segments are rufescent.

Distribution. BRITISH COLUMBIA: Fernie, Merritt (*Leech*), Van [couver Is.] (*type*). ALBERTA: Beaver Cr. (*Leech*), Happy Valley (*Lane, Leech*). WASHINGTON: Blue Mts. (Coppei Cr., Mill Cr.), Wawawai (*Fall*). IDAHO: Troy (*Lane*), Waha. OREGON: Kamela, Meachem.

I am renaming this species after Miss Frances Bjorkman, the collection by whom at Fernie, British Columbia, of a series with extremely obtuse posterior pronotal angles brought the variable nature of the species to my attention.

In view of the extreme form assumed by certain specimens of this species, it will be necessary to insert "usually" between "prothorax" and "narrower" in the first line of Fall's key (l. c., p. 3) so that it reads "Prothorax usually narrower at base than near middle."

AGABUS CORDATUS LeC.

Anisomera cordata LeC., Proc. Acad. Nat. Sci. VI., 1853, p. 226; Col. Kansas 1859, p. 5, pl. 2, fig. 3.—Crotch, Trans. Amer. Ent. Soc. IV, 1873, p. 424.

Agabus (Anisomera) cordatus LeC.—Sharp, On Aquat. Carn. Col. 1880-82, p. 494, pl. xiii, fig. 165.

Agabus (Gaurodytes) cordatus LeC.—Seidlitz, Verh. Nat. Ver. Brünn XXV, 1887, p. 84.—Zimmermann, Col. Cat. 71, 1920, p. 163.

Agabus (Hydronebrius) cordatus LeC.—Fall, Rev. N. A. Species Agabus 1922, pp. 1, 3, 9.—Zimmermann, Kol. Rundsch. XX, 1934, p. 152.

The pronotum of this species is strongly cordate, the width at the base being five-sixths or less that at the middle. The hind angles vary from slightly acute to somewhat obtuse, usually being nearly rectangular, with the sides in front of the hind angles usually subparallel for an appreciable distance before curving out. In one of a pair of specimens from Colorado Springs, Colo., however, the sides curve out almost immediately from the hind angles. The color is usually piceous, as Fall describes, but I have seen a nearly black specimen from Mt. Lemon, Ariz.

Distribution. MONTANA: Missoula (*Fall*); COLORADO: Colorado Springs and Leadville (*Fall*), Morley (*Cal. Acad.*); NEW MEXICO: Santa Fe (*type*), Pecos (*Fall*); ARIZONA: Mt. Lemon (*Cal. Acad.*); UTAH: Ft. Douglas (*Fall*), Salt Lake; WASHINGTON: Longmires = ?Longmire (*Cal. Acad.*).

Fall and Zimmermann have suggested that *cordatus* and *rectus* belong in the subgenus *Hydronebrius* Jakovl., but this subgenus is distinguished in important measure not only by the subcordate pronotum but by the absence of setae from the inner apical angle of the lower surface of the metafemora and the irregularly punctuate lower surface of the metatibiae. As regards the metafemora, both of the species possess the setae said to be absent in *Hydronebrius*. The condition of the metatibiae is more ambiguous, but is nearly similar to a species like *seriatus* Say, which no one would suggest placing in *Hydronebrius*. Furthermore Zimmermann (l. c., pp. 156-158) notes numerous Palaearctic species of the subgenus *Gaurodytes* in which the sides of the pronotum are convergent behind, so that the precise placing of the interesting Nearctic species here considered must await future study.

I am indebted to Mr. M. C. Lane and Mr. Hugh B. Leech for specimens and suggestions used in prosecuting this study.

Mortality of Aquatic Diptera Due to Freezing.[1]

By J. W. LEONARD.

Factors influencing the abundance of insects spending all or parts of their life cycles in fresh water are coming to receive a larger amount of attention than formerly, largely because of a better appreciation of the economic importance of such organisms in the food cycle of game fishes. Although the general population level of such insects is in the main regulated by the interaction of recognized and more or less predictable ecological factors, the rare occurrence of a sudden, catastrophic change in some part of the environment may drastically reduce the numbers of a particular species, even though normal conditions may return as rapidly as they were banished.

An example of a catastrophe of this sort was witnessed recently in a small (seven-acre) pond in Livingston County, Michigan. The last two weeks of March, 1938, were characterized by unusually high temperatures, which on one occasion rose above 80°F. The warm weather was broken abruptly on the night of April 4 when the temperature dropped to 24°F. Early the following morning, when a visit was made to the pond, it was found that all save a small protected portion of the pond's surface was covered with ice which, near shore, reached a thickness of one-half inch.

The period of ice formation had obviously coincided with the time of emergence of a great number of midges, *Chironomus plumosus* (Linn.)[2], for around three sides of the pond the ice was thickly dotted with pupae and adults of this species either wholly or partially embedded therein. Mortality appeared to be universal among the pupae and adults that were entirely embedded. One pupa, held to the ice by the extreme tip of the abdomen only, was alive when found, although its ability to have emerged successfully upon release is open to question. A small number of adults which had apparently completed their emergence before the ice formed lay in a numbed condition on

[1] Contribution from Institute for Fisheries Research, Michigan Department of Conservation and University of Michigan.

[2] Determined by Prof. M. W. Boesel.

the surface of the ice until they were warmed into activity by the sun, when they were eaten by a tree swallow, (*Iridoprocne bicolor*), which swooped repeatedly to within a few inches of the ice. By late afternoon, when all the ice had melted, large windrows and rafts of lifeless pupae and adults collected in eddies and shallow embayments around the shore.

Owing to the tendency of an entire age-group of midges to emerge at about the same time, there exists a strong likelihood that the local population of this economically important midge sustained a severe reduction. A few observations made at about the same time for the next two or three years should settle the question definitely. In any event, it is felt that the present case offers an illuminating demonstration of how disaster to an important component of a fauna may strike, do its damage, and disappear, leaving only the briefest record of its nature. It may be that such an occurrence is not uncommon, but goes undetected because no observer is present at the time.

The Usage of the Names Epizeuxis Hübner and Zanclognatha Lederer (Lepidoptera, Phalaenidae, Herminiinae).

By J. G. Franclemont, Ithaca, New York.

At the suggestion of Dr. J. H. McDunnough, of Ottawa, Canada, I am writing this in an attempt to straighten out the usage of the generic names *Epizeuxis* Hübner, *Camptylochila* Stephens and *Zanclognatha* Lederer.

The genus *Epizeuxis* was proposed by Hübner in 1818 (Zutr. z. Samml. exot. Schmett., i, 9) containing two species *Epizeuxis lituralis* Hbn. (figs. 19 and 20) and *Pyralis calvarialis* D. and S.; Grote designated the latter species as type in 1874 (Bull. Buff. Soc. Nat. Sc., ii, 47). Stephens described *Camptylochila* in 1834 (Ill. Brit. Ent., Haust., iv, 21) for two new species *undulalis* and *bistrigalis* which equal respectively *Epizeuxis aemula* Hbn. and *E. lubricalis* Gey.; Barnes and McDunnough 1917 (Contrib. Nat. Hist. Lep. N. Am., iv, 125) designate *Camptylochila undulalis* Steph. (*E. aemula* Hbn.) as type, and the genus thus falls to *Epizeuxis* Hbn. *Helia* Guenée 1854

(Spec. Gen. Lep. viii (Deltoides), 75) nec *Helia* Hübner 1818 (Zutr. z. Samml. exot. Schmett., i, 27) with type *Pyralis calvarialis* D. & S. designated by Guenée (op. cit.) is a synonym also; likewise *Pseudaglossa* Grote 1874 (Bull. Buff. Soc. Nat. Sc., ii, 47) with type *Epizeuxis lubricalis* Gey. designated by Grote (op. cit.).

Lederer proposed the genus *Zanclognatha* in 1857 (Noct. Europas, 211) including six species; Grote 1874 (Bull. Buff. Soc. Nat. Sc., ii, 49) designated the first species *Paracolax tarsiplumalis Hbn.* as type. The following three genera described by Grote are considered synonymous; *Cleptomita* 1873 (Trans. Am. Ent. Soc., iv, 301) with the sole included species *C. atrilineella* Grote automatically becoming the type; *Megachyta* 1873 (Trans. Am. Ent. Soc., iv, 306) with the one included species *Epizeuxis lituralis* Hbn. becoming automatically the type; *Pityolita* 1873 (Bull. Buff. Soc. Nat. Sc., i, 39) including only the species *Herminia pedipilalis* Guenée which thus automatically became the type.

From the foregoing discussion it will no doubt be obvious that we must revert to the Smith (Revision of the Deltoid Moths, 1895) usage of the two names, and reject the usage advocated by Barnes and McDunnough (Contrib. Nat. Hist., Lep. N. Am., iv, 125, 1917) and again by McDunnough (Check List Lep. Can. & U. S. A., pt. i, Marcolep., 1938). The two genera and their synonyms may be cited as follows:

Epizeuxis Hbn.
Camptylochila Steph.
‡*Helia* Gn.
Pseudaglossa Grt.
Zanclognatha Ledr.
Cleptomita Grt.
Megachyta Grt.
Pityolita Grt.

substituting *Epizeuxis* Hbn. for *Camptylochila* Steph. and *Zanclognatha* Ledr. for *Epizeuxis* Hbn. as used by McDunnough in his latest Check List (page 129).

I wish to express my thanks to Mr. J. F. G. Clarke of the United States National Museum for consulting the original text of the Zutr. z. Samml. exot. Schmett., which is not in the Cornell University Library.

Current Entomological Literature

COMPILED BY V. S. L. PATE, L. S. MACKEY and E. G. FISHER.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the current or preceding year unless otherwise noted. All continued papers, with few exceptions, are recorded only at their first installment.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Note. References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of Entomological News for 10c. The number of, or annual volume, and in some cases the part, heft, &c., the latter within ( )follows; then the pagination follows the colon :

Papers published in the Entomological News are not listed.

GENERAL.—Anon.—Index to publications of U. S. Dept. Agr. 1931-1935. U. S. D. A. 1937. **Anon.**—El Bachaco. [El Agric. Venezolano] 3, (31) :22-24, ill. **Anon.**—Insects in Department of Biology. [Rep. Nat. Mus.] 1938 :38-40. **Babcock, H. L.**—How to find a bee-tree. [New Engl. Nat.] 1: 2-3. **Bailey, H. L.**—Report of Revision of Insect control. [19th Bien. Rep. Comm. Agr. Vermont] 1937-38 :74-90. **Beutler, R.**—Der geschmacksinn der Ameisen. [88] 50 :822-823. **Bialaszewicz, K.**—Recherches sur le metabolisme chemique et energetique au cours du developpement des Insectes. [Soc. Sci. et Lett. Varsovie Trav. Inst. Nencki] Part III, Vol. 13 :352-382; Part IV, Vol. 14 :20-42; Part V. Vol. 14 :229-272. **Bishopp, F. C.**—Some problems in medical and veterinary entomology. [Jour. Parasit.] 25 :1-9. **Blair & Hubbell.**—The biotic districts of Oklahoma. [Amer. Midl. Nat.] 20 :425-454, ill. **Cockerell, T. D. A.**—Studies of Island Life. [Univ. Colo. Stud.] 26 : 1-20. **Crampton, G. C.**—The interrelationships and lines of descent of living insects. [5] 45 :165-180, ill. **Curran, C. H.**—On eating insects. [Nat. Hist.] 43 :84-89. **Darlington, P. J.**—The origin of the fauna of the Greater Antilles, with discussion of dispersal of animals over water and through the air. [73] 13 :274-300, ill. **Daubenmire, R. F.**—Merriam's life zones of North America. [73] 13 :327-332. **Daviault, L.**—Contribution a l'etude des Insectes du Bouleau [Contr. l'Inst. Zool. l'Univ.

Montreal] 1:134 pp., ill. **Folsom & Woke.**—The field cricket in relation to the cotton plant in Louisiana. [U. S. D. A.] Tech. Bull. 642:1-27, ill. **Hoyle, W. L.**—Transmission of poultry parasites by birds with special reference to the "English" or house sparrow and chickens. [Trans. Kansas Acad. Sci.] 41:379-383. **Huxley, J. S., et al.**—Papers for the second symposium "Geographical isolation as a factor in species formation." [Proc. Linn. Soc. London] 150th Session: 253-293. **Ihering, R. von.**—Em prol da catalogacao da fauna do Brasil. [Livr. Jubilar Prof. L. Travassos, Rio de Janeiro] 1938:221-229. **Lameere, A.**—Precis de zoologie V. Les insectes supérieurs. Chap. XVI les Holométaboliques (Lepid., Coleop., Hymenop.). [Recueil de l'Inst. Zool. Torley-Rousseau] 7:161-536, ill. **Li, Ju-chi.**—A simple technique for demonstrating insect chromosomes. [Peking Nat. Hist. Bull.] 13:111-112. **Long, C. I.**—Insect galls. [Sci. Monthly] Feb. 1939:152-158, ill. **Neiva, A.**—Lauro Travassos. [Livr. Jubilar Prof. L. Travassos, Rio de Janeiro] 1938: I-XVIII, portrait. **Pierce & Pool.**—The fauna and flora of the El Segundo sand dunes. I.—General ecology of the dunes. [38] 37:93-97. **Poulton, E. B., et al.**—Papers for the symposium "The concept of species from the time of Linnaeus to the present day." [Proc. Linn. Soc. London] 150th Session: 224-252. **Pratt, H. P.**—Ecology of the trout of the Gunnison River, Colorado. [Univ. Colo. Studies] 26: 114-118 [abstract of thesis]. **Proctor, W.**—Biological Survey of the Mount Desert Region. Part VI. The Insect Fauna. [Wistar Inst.] 1938: 496 pp., ill. **Ramsbottom, J.**—Linnaeus and the species concept. [Proc. Linn. Soc. London] 150th Session: 192-219. **Scheerpeltz, O.**—The spider-hunt of Priocnemis fuscus (Hym.-Psammocharid.) a chapter from the biology of a spider-hunter. [Photographie und Forschung] 2:201-211, ill. **Sen, P.**—A note on the overwintering of the house fly, Musca domestica. [Indian J. Med. Res.] 26:535-536. **Sturtevant, A. H.**—Essays on Evolution, III: On the origin of interspecific sterility. [73] 13:333-335. **Tamini, E.**—Drosofile, lieviti e batteri. [Natura] 29: 149-156. **de la Torre-Bueno, J. R.**—Unkind words on insect descriptions. [19] 34:57-58. **Trager, W.**—Acquired immunity to ticks. [J. Parasit.] 25:57-81, ill.

ANATOMY, PHYSIOLOGY, ETC.—Anon.—Reactions of house-flies to light of different wave-lengths. [31] 143: 208. **Aubertot, M.**—Présence d'un vaisseau dorsal contrac-

tile chez les Protoures du genre Acerentomon. [C. R. L'-Acad. Sci. Paris] 208:120-122, ill. **Bodenstein, D.**—Imaginal differentiation inaugurated by oxygen in Drosphila pupae. [Proc. Nat. Acad. Sci.] 25: 14-16. **Bounhiol, J. J.**—Recherches expérimentales sur le déterminisme de la métamorphose chez les Lepidopteres. [78] 199 pp., ill. **Brecher, L.**—Der Weg der Farbanpassung bei Schmetterlingspuppen vom Rekeptor bis zum Effektor. [Biologia Generalia] 14:212-237, ill. **Buck, J. B.**—Synchronous rhythmic flashing of fireflies. [73] 13:301-314. **Buxton, P. A.**—Biology of Xenopsylla cheopis (Siphonaptera). [Indian J. Med. Res.] 26:505-530, ill. **Cameron, T. W. M.**—The reactions of the housefly, Musca domestica to light of different wave-lengths. [Canad. J. Res.] 16:307-342, ill. **Cappe de Baillon & Favrelle & Vichet.**—Parthenogenese et variation chez les Phasmes. [78] 72:1-46. **Clausen, R.**—Untersuchungen uber den männlichen Copulationsapparat der Ameisen, speziell der Formicinae. [41] 17:233-346, ill. **Cousin, G.**—La néoténie chez Gryllus campestris et ses hybrides. [78] 72: 79-118, ill. **Davis, R.**—The gross anatomy of Corizus lateralis (Hem., Corizid.). [Iowa State Coll. J. Sci.] 13:60-62. [abstract of thesis]. **Ebeling, W.**—Host-determined morphological variations in Lecanium corni. [Hilgardia] 11: 613-631, ill. **Ellenby, C.**—Metabolic rate of early vestigial and wild-type prepupae of Drosophila melanogaster in relation to genotype, sex, size. [Proc. Zool. Soc. London Abst. Papers] 108 (C):46-47. **Ephrussi & Chevais.**—Developpement des couleurs des yeux chez la Drosophile. [78] 72: 48-78, ill. **Geigy, R.**—Beobachtungen uber die Metamorphose von Sialis lutaria (Neurop.). [41] 17:144-157, ill. **Ghelelovitch, S.**—Influence du jeûne sur la métamorphose des chenilles de Galleria mellonella [C. R. Soc. Biol. Masson et Cie, Paris] 129: 1106-1107. **Gohrbandt, I.**—Dastympanalorgan der Syntomiden [34] 125:23-29, ill. **Grandjean, M. F.**—See under Arachnida. **Gwatkin & Fallis.**—Bactericidal and antigenic qualities of the washings of blowfly maggots. [Canad. J. Res.] 16 (D): 343-352. **Hathaway, C. R.**—Verificacao da viviparidade em Thysanoptera. [Mem. Inst. Oswaldo Cruz] 33:357-358, ill. **Jannone, G.**—Aspetti bio-morfologici e somatometrici des problema delle fasi nel Dociostaurus marocannus in Italia e fuori, con particolare riquardo alla provincia di Napoli. [Boll. R. Lab. Ent. Agr. Portici] 1:261-328, ill. **Kuhn, A.**—Weitere Untersuchungen

über den Gen-A-Wirkstoff bei der Mehlmotte Ephestia kühniella. [Nachrichten aus der Biol.] 2:239-249, ill. **Lameere, A.**—See under General. **Lepesme, P.**—Influence de la temperature et l'humidité sur la pathogénie de l'aspergillose des Acridiens. [C. R. Séances L'Acad. Sci. Paris] 208: 234-236. **Lison, L.**—Sur la structure et l'histophysiologie des tubes de malpighi chez le doryphore (Leptinotarsa decemlineata). [C. R. Soc. Biol. Paris Masson et cie] 129: 873-875. **Lloyd, P. C.**—See under Hymenoptera. **Mauser, F.**—Synchrome Metamorphose deplantierter Vorderbeine mit dem Wirtstiere, Dixippus morosus (Orth: Phasmid.). [Biologia Generalis] 14:179-211, ill. Mikulska, I. Porownaawcze studia nad sposobem zycia i przeolbràzenieum gasienic wstegó wek (Catocala). Lebensweise und Metamorphose. [Mem. de l'Acad. Polonaise Sci. et des Lett.] 1938 (B): 1-113, ill. **Minkiewiez, R.**—Les lois de la sexualisation des couleur chez les Insectes. [Soc. Sci. et des Lett. à Varsovie Trav. Inst. Nencki] 13:144-214. **Moon, H. P.**—The growth of Coenis horaria, Leptophlebia vespertina and L. marginata (Ephemeroptera). [Proc. Zool. Soc. London-Abst. Papers] 108 (C): 45. **Muller & Mackenzie.**—Discriminatory effect of ultra-violet rays on mutation in Drosophila. [31] 143:83-84. **Munchberg, P.**—Ueber die entwicklung und die Larve der Libelle Sympetrum pedemontanum Allioni, zugleich ein Beitrag uber die Anzahl der Häutungen der Odonatenlarven. [52] N. F. 7:559-568, ill. **Patay, R.**—Sur la structure et l'histophysiologie des tubes de malpighi chez le doryphore. [C. R. Soc. Biol. Masson et Cie., Paris] 129: 1098-1099. **Peacock, A. D.**—Parthogenesis as illustrated in the late Dr. J. A. van Rossum's experiments with Pseudoclavellaria amerinae (Hym., Tenthr.). [101] 1938:1-13, ill. **Pictet, A.**—La distribution géographique des organismes et le problème du transformisme. [C. R. Soc. Phys. et d'Hist. Nat. de Genève)] 55:88-90. **Plagge, E.**—Bewirkung der Augenausfärbung der rotaügigen Rasse von Ephestia kühniella durch Implantation artfremder Hoden. [Nachrichten aus der Biol.] 2:251-256. **Pollitzer, O.**—Die Legerate von normalen Drosophila-Weibchen und die Einwerkung von Umweltbedingungen. [Lotos] 86:57-62. **Roy, D. N.**—Number of eggs of common house-frequenting flies. [Indian J. Med. Res.] 26:531-533. **Russo, G. V.**—Contributo alla conoscenza dei Coleotteri Scolitidi. Fleotribo: Phloeotribus scarabaeoides Parte Prima. [Boll. del R. Lab. Ent.

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